ATTACHMENT B
TO
RESPONSE AND AMENDMENT UNDER 37 C.F.R. §1.111
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<u>COMPUTER IMPLEMENTED</u> SYSTEM MANAGEMENT TOOL AND METHOD

Field of the Invention

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The present invention relates generally to the field of software tools for organizations and more particularly to a system management tool.

Background of the Invention

10   There are a number of software tools for analyzing organizations and businesses. The most widely used and popular is the spreadsheet. Spreadsheets are used for accounting, budgeting, and analyzing numbers including some engineering projects. However, the spreadsheet is a general purpose product that does not integrate all the functions required by many organizational problems. Other products are designed for

15   more specific purposes, such as financial accounting, cost accounting and project accounting problems. While these packages can be very helpful, they all are concerned with the monetary accounting surrounding a problem. Obviously, monetary accounting of organizational problems is very important however, other parameters need to be tracked and monitored to get a complete picture of how an organization system is working. These

20   parameters can include availability of subsystems, failure rates of subsystem, etc. Some of the software packages provide some ability to track other parameters; however, monetary parameters always seem to control the structure.

Thus, there exists a need for a system management tool that is not driven by accounting concerns but by management concerns.

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Brief Description of the Drawings

FIG. 1 is a block diagram of a system management tool in accordance with one embodiment of the invention;

5   FIG. 2 is a block diagram of a system management tool in accordance with one embodiment of the invention;

FIG. 3 is a screen shot of a home page of a system management tool in accordance with one embodiment of the invention;

FIG. 4 is a screen shot of a database query in a system management tool in

10   accordance with one embodiment of the invention;

FIG. 5 is a screen shot of a database report in a system management tool in accordance with one embodiment of the invention;

FIG. 6 is a screen shot of a graph of a metric in a system management tool in accordance with one embodiment of the invention;

15   FIG. 7 is a screen shot of a graph of a metric in a system management tool in accordance with one embodiment of the invention;

FIG. 8 is a screen shot of a graph of a metric in a system management tool in accordance with one embodiment of the invention; and

FIG. 9 is a flow chart of the steps used in a method of operating a system

20   management tool in accordance with one embodiment of the invention.

FIG. 10 is a flow chart of the steps used in a method of operating a system management tool in accordance with one embodiment of the invention.

Detailed Description of the Drawing

A system management tool includes an input system. An electronic library is connected to the input system and includes a process diagram for modeling a system. An evaluation system is connected to the electronic library. A corrective action system is connected to the evaluation system. An assessment and analysis system is connected to the corrective action system. The assessment and analysis system measures and documents a corrective action. The tool is designed to monitor a system, which is defined in the process diagram. The tool not only includes an evaluation system but a corrective action system. An assessment and analysis system is used to determine how well the corrective action is being implemented.

FIG. 1 is a block diagram of a system management tool 10 in accordance with one embodiment of the invention. An input system 12 is connected to an electronic library 14 for entering therein data relating to the various systems and subsystems (e.g., sensors) being monitored. The electronic library 14 stores all the data that is entered via the input system 12. The input system 12 can be a terminal in which the data relating to the various systems and subsystems is manually entered or the data can be automatically received from a subsystem in the system being monitored. The electronic library 14 also includes a process diagram 16 for the process modeling the systems and subsystem being monitored. The process diagram 16 describes all the inputs into and outputs from the system management tool 10 regarding the systems and subsystems being monitored. An evaluation system 18 is connected to the electronic library 14. The evaluation system 18 compares the system's performance of the systems and subsystems being monitored from data stored in the electronic library 14 against a number of different metrics (plurality of metrics) stored in electronic library 14. Evaluation means to find the value or amount of, to judge or determine the worth or quality of what is evaluated, and so the evaluation system 18 is a system to find the value or amount of, to judge or determine the worth or quality of, what is being evaluated. A corrective action system 20 is connected to the evaluation system 18. The corrective action system 20 includes plans to correct concerns discovered by the comparisons against metrics performed by the evaluation system 18. The corrective action system 20 includes metrics to determine if the corrective action

worked. Corrective means tending or meant to correct or improve, a remedial, and so

corrective action relates to the doing of something remedial or tending to or meant to

correct or improve what is being considered, and so the corrective action system 20 is a

system for the doing of something remedial or tending to or meant to correct or improve

5   what is being considered. An assessment and analysis system 22 is connected to the

corrective action system 20. The assessment and analysis system 22 measures any

corrective actions provided by the corrective action system 20. Assessment means the act

of assessing or of estimating or determining the significance, importance or value of, in

this instance, performance relative to a goal or of a sensor. Analysis means a separating

10   or breaking up of any whole into its parts, especially with an examination of these parts to

find out their nature, proportion, function, interrelationship, and the like. Assessment and

analysis system 22 is a system for assessing or estimating or determining the significance,

importance or value of, in this instance, performance relative to a goal or of a sensor, such

as by separating or breaking up of any whole into its parts, especially with an examination

15   of these parts to find out their nature, proportion, function, interrelationship, and the like.

Financial information is treated as just another input or output of the system being

monitored by the system management tool 10. As a result, the system management tool

10 is not limited to or by an accounting system mentality.

FIG. 2 is a block diagram of a system management tool 30 in accordance with one

20   embodiment of the invention. A user of the system management tool 30 may access the

system management tool 30 using a network (e.g., Internet--World Wide Web). A user

having a computer 32 with a web browser system connects in system management tool 30

through a network 34 to a web page server 36. An access control system 38 limits access

to the web page server 36. In one embodiment, the access control system 38 requires a

25   correct password be entered before the user is allowed access to web page server 36 and

elements connected thereto for displaying data therefrom on the monitor of the web

accessing computer 32. In other embodiments, further security measures are

implemented. The web page server 36 is connected to an electronic library 40. The

electronic library 40, in this embodiment, includes both data from the system or systems

30   being monitored and documents that are required by personnel working on the system or

systems being monitored. An evaluation system 42 is connected to the web page server

36. A corrective action system 44 is connected to the web page server 36. An assessment
and analysis system 46 is connected to the corrective action system 44 via web server 36.
The assessment and analysis system 46 measures any corrective actions provided by the
corrective action system 44. By having the system management tool 30 designed for a
network, it allows the system management tool 30 to be shared by multiple users in many
different locations, e.g. wherever a computer with web browser 32 is available.

A system management tool 10, 30 comprises an input system 12, an electronic
library 14, 40 connected to the input system 12 and including a process diagram 16 for
modeling a system, an evaluation system 18, 42 connected to the electronic library 14, 40,
a corrective action system 20, 44 connected to the evaluation system 18, 42, and an
assessment and analysis system 22, 46 connected to the corrective action system 20, 44,
the assessment and analysis system 22, 46 measuring a corrective action. The tool 10, 30
may include a report writing wizard with cut and paste functions from the electronic
library 12, 40, the evaluation system 18, 42, the corrective action system 20, 44 and the
assessment and analysis system 22, 46. The tool may include a plurality of interactive
links 82-94 connected to the evaluation system 18, 42, and the interactive links 82-94 may
include a central data repository 84 (part of electronic library 14, 40) storing all the data
for the system. A plurality of hyperlinks 82-94 may provide access to the electronic
library 14, 40, the evaluation system 18, 42 and the corrective action system 20, 44. The
evaluation system 18, 42 may include a plurality of metrics 98, 102 and a plurality of
associated thresholds 100, and may include a graphing system for displaying each of the
plurality of metrics 98, 102 and each of the plurality of associated thresholds 100. The
corrective action system 20, 44 may include a forecasting tool 66, 92.

A system management tool 10, 30 comprises a web browser system 32, a network
34 connected to the web browser system 32, an access control system 38 connected to the
network 34, a web page server 36 connected to the access system 38, an electronic library
14, 40 accessible from the web page server 36, an evaluation system 18, 42 accessible
from the web page server 36; and a corrective action system 20, 44 accessible from the
web page server 36. The tool 10, 30 may include an assessment and analysis system 22,
46 accessible from the web page server 36, the assessment and analysis system 22, 46
measuring a corrective action. The electronic library 14, 40 may include a process

diagram 16, 80 defining an input and an output. The tool 10, 30 may include a report

writing system 112 accessible by the web browser system 32. The tool 10, 30 may

include interactive links 82-94 accessible from the web page server 36 containing a data

repository 84.

5   FIG. 3 is a screen shot of a home page 60 of a system management tool 10, 30 in

accordance with one embodiment of the invention. The home page 60 is designed to have

a graphical look that emphasizes the functions of the ~~tool~~ system management tool 10, 30,

e.g., using graphical symbols (icons) arranged in a logical manner and connected by

arrows suggestive of a block diagram or system diagram of the system management tool

10 10, 30. The graphical symbols are hyperlinks. Library 62 and Interactive Links 82

provide icons for hyperlinks to various databases and sources of information described

below, and Decision Support Indicators 96, Features 104 and TPE Assessment 120

regions provide icons for hyperlinks to tools described below useful to a user of system

10, 30 for navigation from home page 60.

15   An electronic library [[62]] 62, 84 including library 62 provides access to a

number of useful documents and reports e.g., via links from home page 60. For instance,

this embodiment, has hyperlinks presented as icons 62-80 to link to archived reports 64,

forecasting model instructions 66, sensor technical baseline information 68, data

repository instructions 70, metric definitions and collection plan 72, Technical

20 Performance Evaluation (TPE) operating instruction 74, decision support system

documentation 76, Qualification Test and Evaluation (QT&E) Procedures 78 and TPE

Process Diagrams 80. This iconic presentation with hyperlinks allows the ~~electronic~~

library 62 to contain most of the reference material that may be required by users of the

system or systems and to be presented together in a defined region or sub-page of home

25 page 60. Interactive links (plurality of interactive links) 82 are ~~next~~ presented together in

a defined region or sub-page adjacent to the library 62 and includes the data repository

(central data repository) 84. Other databases 86 are also accessible via links from home

page 60, e.g., a database identified by the acronym ESR, the meaning of which is not

relevant to the system management tool 10, 30 or necessary to understand the operation

30 thereof as described herein. In addition, other tools such as databases 88, 90 are

accessible via links from home page 60, e.g., tools identified by the acronyms PDMS,

MIDIS and RAMES, the meanings of which are not relevant to the function of system

management tool 10, 30 and are not necessary to understanding the system management

tool 10, 30 described herein. A forecasting model (forecasting tool) 92 is accessible and

other links 94 may also be accessible via links from home page 60. A decision support

5   indicators section (evaluation system) 96 is next to the interactive links 82.

Decision Support Indicators 96 are presented together in a defined region or sub-

page adjacent to the interactive links 82 region or sub-page. Under the decision support

indicators 96 are hyperlinks represented by icons 98-102 representing forecasting

indicators 98, threshold indicators 100 and unstable process indicators 102, e.g., also

10   referred to as unstable metrics. Next to the decision support indicators 96 is a features

section 104.

Features 104 are presented together in a defined region or sub-page adjacent to the

Decision Support Indicators 96 region or sub-page. The features section 104 includes

hyperlinks represented by icons 106-118 representing a number of different options, such

15   as email 106 icon to open a window for sending an e-mail message and search 108 icon to

open a window from which to utilize searching capabilities. A courses of action section

110 icon opens a window that is used to determine and document corrective actions, e.g.,

to determine previous corrective actions and to document new corrective actions. A

report writing feature (report writing system) 112 icon accesses a report writing feature

20   that simplifies the process of collecting data and information for reports 112, since all the

required data and information is part of the system 10, 30, e.g., accessed via hyperlinks of

library 62 and of interactive links 82, and can be cut and pasted (e.g., electronically

selected, copied and inserted) into a report 112. In addition, the reports section 112 has a

report writing wizard that contains the basic format and layout for many required reports.

25   The features section 104 also contains icons for hyperlinks accessing a Decision Support

System (DSS) options section 114, on-line help section 116 and metric relationships

section 118. A TPE assessment section 120 is next to the features section 104. TPE

Assessment features 120 are presented together in a defined region or sub-page adjacent

to the Features 104 region or sub-page. The TPE assessment section 120 includes

30   hyperlinks represented by icons 122-124 representing a goal assessment system 122 and a

sensor assessment section 124.

FIG. 4 is a screen shot 140 of a database query in a system management tool in
accordance with one embodiment of the invention. The screen shot 140 query is of the
ESR Database link 86 which provides information, e.g., on monthly outages for each site.
In this example, the 21st Space Wing ESR Report is the subject of the query and

5   information from the ESR Report of information provided by the 21st Space Wing
organization is presented on screen shot 140. A drop-down menu 142 is provided to
select a time period for the query, e.g., "Nov 99." The screen shot 140 shows that the user
has selected the November 1999 ESR report which has a 79% availability rating. The
user may run the report by clicking on the Run ESR Report button 144 or may cancel the

10   query of ESR Database 86 by clicking on the Cancel button 146. Screen shot 140 may be
accessed by clicking on the ESR Database link 86, e.g., the ESR Database link 86 found
on screen shot 60 of FIG. 3 or on screen shot 160 of FIG. 6.

FIG. 5 is a screen shot of a database report 150 in a system management tool 10,
30 in accordance with one embodiment of the invention. The user receives the report

15   shown in FIG. 5 titled STATUS REPORT MISSION relating to Operational Availability
(Ao) for November 1999 in response to selecting a month and year from drop down menu
142 and clicking on the Run ESR Report button 144 of screen shot 140 of FIG. 4. This
allows the user to understand why the system received a 79% availability rating for the
month of November 1999 in this example. The report screen 150 shows on the right-hand

20   side thereof the total time 152 ~~and date~~ that the system was down and the start and stop
times and dates 154 the system was down, e.g., dates and times in November 1999 in this
example. The remarks section 156 explains why the system was down and a reference
158 to the number of the related ESR Report is also provided. A closer look at the
~~remarks~~ Remarks section 156 shows the system including elements Spacetrack and FPS-

25   00 was down ("RED") mainly to test new software versions identified as "ESC DT&E".
A manager might use this information to justify equipment to test the software other than
by using the operational system, i.e. a corrective action.

The Status Report of screen shot 150 includes on the left-hand side thereof
information 159 defining the systems and subsystems to which the information on the

30   right-hand side thereof pertains. Among this information 159 that may be present in this
report format 150 is information that may be displayed under various headings, for

example, the site (SITE), equipment (EQUIP), channel (CHN) and work unit code

(WUC), as well as mission impact codes (MIC, MICB, etc.), relating to the systems and

subsystems, such as Spacetrack and FPS-00, listed under Remarks. The foregoing

meanings of the example abbreviations and acronyms are known to users of an

5   embodiment of system management tool 10, 30, but are examples not necessary to

understanding the operation thereof. Where a system is noted as being "RED" under

Remarks 156, the red or down condition is indicated by the letter "R" in various ones of

the information 159 headings at the left-hand side the Status Report of screen shot 150.

Screen shot 150 includes a scroll bar along the right hand edge thereof for easily scrolling

10   through the information provided thereby, when the number of selections exceeds what

can be displayed in screen shot 150.

FIG. 6 is a screen shot 160 of an example report from Data Repository 84 of

Interactive Links 82 which includes a graph 162 of a metric in a system management tool

10, 30 in accordance with one embodiment of the invention. The screen shot 160 shows a

15   graph (graph system) of the operational availability (Ao) of a sensor site 162. A threshold

164 of 95% is shown on the graph and on the Threshold link 169 located beneath the

graph. It is easy to see that the displayed example sensor site is rarely making its goal of

95% operational availability (Ao).

Screen shot 160 provides a menu bar 61 and other hyperlinks, indicated by

20   underlined symbols, words and phrases, for conveniently navigating to other parts of

system management tool 10, 30, as may be desired by a user thereof without having to

return to home page 60. Interactive Links 82 is highlighted on menu bar 61 to indicate

that screen shot 160 is among the selections available under the Interactive Links 82

heading on home page 60. For example, just below the menu bar 61 are hyperlinks to

25   Metric Definitions and Collection Plan 72, to View Sensor Site Excel Workbook 85 of

data repository 84, to ESR Database 86 and to Threshold Indicators History 100. The

View Sensor Site Excel Workbook link 85 is a link to view an Excel spread sheet

workbook of data relating to the selected Sensor Site. Threshold indicators history link

100 is to a history of the threshold indicators relating to the data displayed 162 on screen

30   shot 160.

Along the left of screen shot 160 are provided menu lists 165, 166, and buttons for

selecting the data to be displayed in graph window 162. For example, Select a Sensor

menu list 165 provides for the selection of a sensor and/or site for which data is to be

displayed, e.g., from among sensors and sites identified as OC3F, Socorro, GLOBUS II,

PARCS, PAVE PAWS, Beale, Cape Cod, and Sensor Site, in this example. A scroll bar

5   is provided at the right side of menu list 165 for scrolling to find a desired sensor on that

list, when the number of selections exceeds what can be displayed in window 165. As

indicated by their being indented in the list of menu 165, Beale and Cape Cod are sites

under the PAVE PAWS sensor and OC3F and Socorro are sites under a sensor whose

name is above the lines of menu list 165 displayed in the window thereof in this example.

10   In this example, Sensor Site is selected as indicated by the highlighting of that selection in

menu list 165 and by the heading information displayed near the top of graph window

162. Sensor Site and the other entries in menu list 165 comprise examples of systems and

subsystems monitored and/or managed utilizing system management tool 10, 30

A Select a Metric menu list 166 is provided for selecting among various metrics,

15   e.g., Number of Hardware Upgrades, Number of Messages Generated, Number of Version

Releases, Objects, Operational Availability (Ao), Projected Cost Savings, QDRs and

Scheduled Downtime Rate (Am). A scroll bar is provided at the right side of menu list

166 for scrolling to find a desired metric on that list, when the number of selections

exceeds what can be displayed in window 166. In addition, selection buttons indicated by

20   circles and underlined links are provided for selecting the information to be displayed in

menu list 166. A user may select a metric (label/instruction indicated by lack of

underline) or may select to Customize Favorites (underlined link) from among the

available metrics. A user may select to view all metrics (selected as indicated by filled in

circle) or to view a list of favorite metrics (unfilled circle), which list of favorites may be

25   customized (underlined link). In this example, Operational Availability Ao is selected

from menu list 166 as indicated by the highlighting of that selection in menu list 166 and

by the heading information displayed near the top of graph window 162 Further, an

asterisk associated with the entry Operational Availability Ao indicates via a displayed

note below menu list 166 that the selected metric is a metric that is an ESR Database 86

30   Metric. The metrics listed in window 166 comprise examples of ones of the plurality of

metrics available for monitoring and/or managing systems and subsystems utilizing

system management tool 10, 30.

In graphical display area 162 is a heading indicating the selected sensor from menu list 165 and the selected metric from menu list 166. In the graph 162, the vertical scale is percentage of Operational Availability Ao which is selected from menu list 166

5   and the horizontal scale is the time period by month and year. The vertical scale is selected for suitable display of the range of values of the metric presented, e.g., from 50% to 100%. The selected Operational Availability Ao metric and the Threshold level 164 are displayed differently in graph 162 so as to be easily discerned by a user and a legend thereof is provided beneath the graph 162, e.g., indicating that Operational Availability

10   Ao is displayed by a solid line and the Threshold by a dashed line. Desirably, a prominent arrow is provided indicating the direction of displayed data of graph 162 that is deemed "good" and specified by the word "GOOD" therein, e.g., in this example, a higher value of the Ao metric is considered to be good. The Threshold indication 169 near the bottom of graph area 162 is underlined indicating it is a link that can be used for displaying

15   information relating to the threshold level that is displayed on the graph 162 for the selected metric and sensor, as well as indicating the threshold level that is displayed.

Thus, system management tool 10, 30 may be used to collect and organize data and metrics from a plurality of diverse sensors and sites, and to present such data in a plurality of formats and combinations that are useful for management.

20   FIG. 7 is a screen shot 170 of a graph 172 of a metric in a system management tool 10, 30 in accordance with one embodiment of the invention. This screen shot 170 shows a graph 172 of an inherent availability (Ai) of a sensor site 172. The target or threshold 174 for this metric is about 99.5%. This sensor site is generally meeting this metric requirement. If this is the same sensor site as shown in FIG. 6, then it would be

25   important to determine what the difference (i.e. relationship) is between these two metrics, since graph 162 appears to show poorer performance than does graph 172. The screen shot 170 lists those metrics related to inherent availability (Ai) and provides for comparison of related metrics. This screen shot 170 contributes to the electronic library 14, 40, evaluation system 18, 42, assessment and analysis system 22, 46 and the

30   corrective action system 20, 44. The electronic library 14, 40 has a definition for all these metrics.

Screen shot 170 provides a menu bar 61 and other hyperlinks, indicated by underlined symbols, words and phrases, for conveniently navigating to other parts of system management tool 10, 30, as may be desired by a user thereof without having to return to home page 60. Features 104 is highlighted on menu bar 61 to indicate that

5   screen shot 170 is among the selections available under the Features 104 heading on home page 60, and the heading Metric Relationships indicates that selection 118 thereunder has been selected. For example, just below the menu bar 61 is a hyperlink to Metric Definitions and Collection Plan 72.

A Select a Relationship menu list 175 is provided for selecting among various

10   related metrics, e.g., Inherent Availability (Ai), MTBCF, MTTRS - Restore System, Operational Availability (Ao), Scheduled Downtime Rate (Am), System Availability (As), and Unscheduled Downtime Rate (Ar). Selection buttons indicated by circles and underlined links are provided for selecting the information to be displayed in menu list 175. A user may select a metric relationship (label/instruction indicated by lack of

15   underline) from among Predefined Groups (selected as indicated by filled in circle) of related metrics or from among Custom Groups (unfilled circle) of related metrics, or may select Create Relationship (underlined link) to create a customized group of metrics from among the available metrics. In this example, Inherent Availability Ai is selected from the group of related metrics displayed in menu list 175 as indicated by the highlighting of

20   that selection in menu list 175 and as also indicated by the heading information displayed near the top of graph window 172. The metrics listed in window 175 comprise examples of ones of the plurality of metrics available for monitoring and/or managing systems and subsystems utilizing system management tool 10, 30.

A user may select from drop down menu 176 a source of the related metric data

25   selected (highlighted) from among the related metrics displayed in menu list 175. In this example, metrics for the 21st Space Wing have been selected in drop down menu 176 and a description of the selected metric for the selected organization is displayed in the window 177 below menu 176 indicating that the source of the selected related metric data is the 21st Space Wing ESR Database 86. A user may also Select a Sensor (e.g., system)

30   from drop down menu 178 in which Sensor Site is selected in this example, as in the example of FIG. 6, from the list of available selections therein, e.g., the same list as

available in menu 165 of screen shot 160.

In graphical display area 172 is a heading indicating the selected sensor, which is Sensor Site in this example, from menu list 178 and the selected related metric, which is Inherent Availability Ai in this example, from menu list 175. In the graph 172, the

5   vertical scale is percentage of Inherent Availability Ai which is selected from menu list 175 and the horizontal scale is the time period by month and year. The vertical scale is selected for suitable display of the range of values of the metric presented, e.g., from 95% to 100%. The selected Inherent Availability Ai metric and the Threshold level are displayed differently in graph 172 so as to be easily discerned by a user and a legend

10   thereof is provided beneath the graph 172, e.g., indicating that Inherent Availability Ai is displayed by a solid line and the Threshold by a dashed line. Desirably, a prominent arrow is provided indicating the direction of displayed data of graph 172 that is deemed "good" and specified by the word "GOOD" therein, e.g., in this example, a higher value of the Inherent Availability Ai metric is considered to be good. The Threshold indication

15   179 near the bottom of graph area 172 is underlined indicating it is a link that can be used for displaying information relating to the threshold level that is displayed on the graph 172 for the selected metric and sensor.

FIG. 8 is a screen shot 180 of a graph <u>182</u> of a metric in a system management tool <u>10, 30</u> in accordance with one embodiment of the invention. The screen shot 180

20   shows a bar chart <u>182</u> of hardware fault ~~distribution density 182~~ distribution/density between February 1993 and March 2000. It is easy to see that subsystem 1-1 184 is the major source of faults. This screen shot <u>180</u> lists those metrics related to hardware fault ~~distribution density~~ distribution/density and provides for comparison of related metrics. This screen shot <u>180</u> contributes to the electronic library <u>14, 40</u>, evaluation system <u>18, 42</u>,

25   assessment and analysis system <u>22, 46</u> and the corrective action system <u>20, 44</u>.

Screen shot 180 provides a menu bar 61 and other hyperlinks, indicated by underlined symbols, words and phrases, for conveniently navigating to other parts of system management tool 10, 30, as may be desired by a user thereof without having to return to home page 60. Features 104 is highlighted on menu bar 61 to indicate that

30   screen shot 180 is among the selections available under the Features 104 heading on home page 60, and the heading Metric Relationships indicates that selection 118 thereunder has

been selected. For example, just below the menu bar 61 is a hyperlink to Metric

Definitions and Collection Plan 72. Screen shot 180 is the same screen shot as screen

shot 170 described above except that a different group of related metrics and a different

data source have been selected, and the data is presented in bar graph format 182. Menu

5   list 175, pull down menus 176, 178 and description window 177 are the same as in screen

shot 170 expect that the information therein corresponds to the different selections of

screen shot 180.

A Select a Relationship menu list 175 is provided for selecting among various

related metrics, e.g., Hardware Fault Distribution/Density, MTBF, MTBMA and MTTR-

10   Repair. Selection buttons indicated by circles and underlined links are provided for

selecting the information to be displayed in menu list 175. A user may select a metric

relationship (label/instruction indicated by lack of underline) from among Predefined

Groups (selected as indicated by filled in circle) of metrics or from among Custom

Groups (unfilled circle) of metrics, or may select Create Relationship (underlined link) to

15   create a customized group of metrics from among the available metrics. In this example,

Hardware Fault Distribution/Density is selected from menu list 175 as indicated by the

highlighting of that selection in menu list 175 and by the heading information displayed

near the top of graph window 182. The metrics listed in window 175 comprise examples

of ones of the plurality of metrics available for monitoring and/or managing systems and

20   subsystems utilizing system management tool 10, 30.

A user may select from drop down menu 176 a source of the related metric data

selected in menu list 175, in this example the metrics from the RAMES database 90

having been selected in drop down menu 176 and a description thereof is displayed in the

window 177 below menu 176 indicating that the source of the selected related metric data

25   is the RAMES Database 90. Information in window 177 may also contain information

relating to availability and limitation of the metrics data, for this example that the data is

based on data from another source (e.g., CAMS inputs) and that only limited data is

available (e.g., data from PAVE PAWS sensor sites and from BMEWS sensor sites is

limited). A user may also Select a Sensor (e.g., a system) from drop down menu 178 in

30   which Sensor Site is selected in this example, as in the examples of FIGS. 6 and 7, from

the list of available selections therein, e.g., the same list as available in menu 165 of

screen shot 160.

In graphical display area 182 is a heading indicating the selected sensor, which is Sensor Site in this example, from menu list 178 and the selected related metric, which is Hardware Fault Distribution/Density in this example, from menu list 175. In the graph 182, the vertical scale is the number of failures or faults of Hardware Fault Distribution/Density as selected from menu list 175 and the horizontal scale is a listing of Sensor Site and of the various sub-systems 184 comprising the system Sensor Site. The time period by month and year is also provided in the heading of graphical display area 182 because the date information is not the horizontal axis in this example. The vertical scale is selected for suitable display of the range of values of the metric presented, e.g., from 0 to 1500 failures. The selected Hardware Fault Distribution/Density metric produces data for each subsystem that is not related to the data for another subsystem and so are displayed in graph 182 as bars of varying height representing the number of failures, so as to be easily compared by a user. The bars of bar graph 182 are displayed from left to right in order of descending height, thereby to more graphically portray the relative data for the various subsystems. The bar representing the number of Sensor Site failures is necessarily higher because it represents the total of the other bars, i.e. because Sensor Site is the example system comprising the example subsystems listed along the horizontal axis . A legend 185 thereof is provided beneath the graph 182, e.g., a dark box 185 indicating that Hardware Fault Distribution/Density is displayed by a bar of like character. Desirably, a prominent arrow 183 is provided indicating the direction of displayed data of graph 182 that is deemed "good" and specified by the word "GOOD" therein, e.g., in this example, a lower value of the Hardware Fault Distribution/Density metric is considered to be good. The Threshold indication 189 near the bottom of graph area 182 is underlined indicating it is a link that can be used for displaying information relating to the threshold level that is displayed on the graph 182 for the selected metric and sensor. Sensor Site and the subsystems listed along the horizontal axis of graph 182 comprise examples of systems and subsystems being monitored and/or managed utilizing system management tool 10, 30

In the screen shots of each of FIGS. 4-8, a menu bar of the web browser of computer 32 is displayed on the display or monitor thereof, e.g., along the upper edge of

screen shot 140, 150, 160, 170, 180, and provides buttons/links for navigating among the various features and functions of the web browser of computer 32, e.g., buttons for forward, back, delete, home page and the like which are common to web browsers and are not used by system management tool 10, 30 which provides its own buttons, menus and

5   links as described herein.

In the screen shots of each of FIGS. 6-8, a menu bar 61, e.g., along the upper edge of screen shot 160, 170, 180, provides buttons corresponding to home page 60 and the links 62, 82, 96, 104, 120 to sub-pages of home page 60. Clicking on a button 62, 82, 96, 104, 120 provides a respective drop down menu or a sub-page for selecting among the

10   various elements 64-80, 84-94, 98-102, 106-118 and 122-124 under elements 62, 82, 96, 104, 120, respectively, of home page 60 of system management tool 10, 30. Simply clicking on the button corresponding to the desired element, e.g., a button for accessing home page 60, a button for Library 62, a button for Interactive Links 82, a button for Decision Support Indicators 96,a button for Features 104 and a button for TPE

15   Assessment 120, produces a drop down menu from which any selection thereunder may be accessed directly by clicking on the name thereof. A question mark button "?" is provided on menu bar 61 for accessing the on-line Help function 116.

The button 62, 82, 96, 104, 120 of menu bar 61 corresponding to the element of system 10, 30 in which the currently displayed function resides is outlined or highlighted

20   to indicate that relationship. For example, when Data Repository 84 under Interactive Links 82 is displayed as in screen shot 160, the menu bar 61 button for Interactive Links 82 is outlined or highlighted, as indicated by the double-lined menu bar 61 button 82 in FIG. 6. and when Metric Relationships 118 under Features 104 is displayed as in screen shots 170 and 180, the menu bar 61 button for Features 104 is outlined or highlighted, as

25   indicated by the double-lined menu bar 61 button 104 in FIGS. 7 and 8. Home page 60 need not have a menu bar 61 because icons 62, 82, 96, 104, 120 providing links to all the elements of system management tool 10, 30 are displayed along the upper region thereof, and on-line help 116 is also a selection option.

Certain sensors that can be managed utilizing system management tool 10, 30 and

30   certain sources of data utilized thereby are designated herein by acronyms, such as PDMS, RAMES, PAVE PAWS, BMEWS and the like, and the meanings of these acronyms are

not relevant to the function of the system management tool 10, 30 or necessary to

understand the operation thereof as described herein.

FIG. 9 is a flow chart of the steps used in a method of operating a system

management tool 10, 30 in accordance with one embodiment of the invention. The

5   process starts, step 200, by transmitting a connection request over a network to a project

34 to a system management server 36, which may include a web server 36 and an access

control system 38 as shown in FIG. 2, at step 202. A front page (home page 60) is

received at step 204. The user then selects from a plurality of options that include an

electronic library 14, 40, a data repository 84 or an evaluation system 18, 42, at step 206.

10   When the data repository 84 is selected by clicking on a link at step 208, the user selects

either to view data or enter data which ends and the process ends at step 210. In one

embodiment, the electronic library 14, 40 is selected and the user then selects from a

process diagram, an instruction manual or a dictionary. When the evaluation system 18,

42 is selected the user can select a metric to analyze. A graph of the metric may be

15   displayed. In one embodiment, the graph includes a threshold. When the evaluation

system 18, 42 is selected, the user can choose between a set of metrics that exceed their

threshold (plurality of associated thresholds). The user can also choose to view a set of

metrics that are unstable. An unstable metric is a metric which may have process

problems.

20   A method 200 of operating a system management tool 10, 30 comprises the steps

of transmitting 202 a connection request over a network 34 to a system management

server 36, receiving 204 a front page 60, selecting 206 from a plurality of options 62-124

including an electronic library 14, 40, a data repository 84 and an evaluation system 18,

42, and, when the data repository 84 is selected 208a by clicking on a link 82-94,

25   selecting 208 either 208b to view data or 208c to enter data. The method 200 may include

the step of selecting 224 a process diagram 80, selecting 226 an instruction manual 66, 74,

76, 78, or selecting 228 a dictionary 76. 80, when the electronic library 14, 40 is selected

206a. The method 200 may include the steps of selecting 212 a metric to analyze when

the evaluation system 18, 42 is selected 206b, and displaying 84, 92, 98, 100, 102, 214 a

30   graph of the metric 162, 172, 182, and may also include the step 216 of displaying 84, 92,

98, 100, 102 a threshold 164, 174. The method 200 may include the step of selecting 218

a set of metrics that exceed their threshold 100, 164, 174 when the evaluation system 18, 42 is selected 206b. The method 200 may include the step of selecting 220 a set of metrics that are unstable 102 when the evaluation system 18, 42 is selected 206b, and/or selecting 222 a set of forecasting indicators 98 when the evaluation system 18, 42 is

5   selected 206b. An unstable metric 102 is a metric which may have process problems (unstable process indicator).

FIG. 10 is a flow chart of the steps used in a method 300 of operating a system management tool 10, 30 in accordance with one embodiment of the invention. Method 300 is similar to method 200 and also includes steps described herein, e.g., described in

10   relation to various ones of FIGS. 2-8 and illustrated therein. Method 300 starts with the step 302 of transmitting a connection request over a network 34, e.g., from a web browser of a computer 32 to a management server, e.g., web server 36, via the Internet, World Wide Web, or other network 34. Step 303 comprises controlling access to the web page server 36 by an access control system 38 associated therewith that limits access to server

15   36 by requiring a user identifier such as a password. If access is granted in step 303, step 304 is the sending and receiving of a home page 60 from the web server 36 to the web browser 32 for display to the user on the monitor of web browser system 32. Home page 60 presents a plurality of links to various functions and options 62-124 that may be accessed by clicking on the icon or link name thereof.

20   Step 306 comprises selecting from a plurality of options 62-124 of functions, databases and tools by clicking on the link thereto wherein the links are arranged under categories including library 62, interactive links 82, decision support links 96, features 104 and TPE assessment 120, and wherein the links and icons are arranged to resemble a system diagram of system management tool 10, 30, e.g., as shown in FIG. 3.

25   When library 62 is selected 310, steps 311-319 comprise selecting one of archived reports 64, forecasting model instructions 66, sensor technical baseline information 68, data repository instructions 70, metric definitions and collection plan 72 TPE operating instructions 74, decision support system documentation 76, QT&E procedures 78 and TPE process diagrams 80, respectively. TPE process diagrams 80 may include process

30   diagrams. Forecasting model instructions 66, data repository instructions 70, TPE operating instructions 74, decision support system documentation 76, and QT&E

procedures 78 may include an instruction manual. Metric definitions and collection plan
72, decision support system documentation 76 and TPE process diagrams 80 may include
a dictionary. Selections 360-369 to display 162, 172, 182 data or to further select data to
be displayed 162, 172, 182 may be made.

5   When interactive links 82 is selected 320, steps 321-326 comprise selecting one of
data repository 84, forecasting model database 92, PDMS tool 88 which includes an
external database, ESR database 86, other interactive links 94 and RAMES tool 90 which
includes an external database, respectively. When data repository 84 is selected 321, step
321a comprises selecting to view data, e.g., as by screen shots 140-180, and step 321b
10   comprises selecting to enter data, e.g., by input system 12 and/or web browser system 32.
Then, selections 360-369 to display 162, 172, 182 data or to further select data to be
displayed 162, 172, 182 may be made. The data therein is useful for evaluation 18, 42.
           When decision support indicators 96 (e.g., evaluation system 18, 42) is selected
330, steps 331-333 comprise selecting one of forecasting indicators 98, threshold
15   indicators 100 and unstable process indicators (unstable metrics) 102, respectively. Then,
selections 360-369 to display 162, 172, 182 data or to further select data to be displayed
162, 172, 182 may be made. Evaluation means to find the value or amount of, to judge or
determine the worth or quality of what is evaluated, and so the evaluation system 18, 42 is
a system to find the value or amount of, to judge or determine the worth or quality of,
20   what is being evaluated. Decision support indicators 96-102 are indicators, a device that
measures or records and visibly indicates to support a decision, e.g., by a user.
Forecasting indicators 98 are indicators that forecast, i.e. that estimate or calculate in
advance, that predict or seek to predict, and threshold indicators 100 are indicators that
relate to a threshold, i.e. the beginning point of something. Likewise, forecasting model
25   92 and forecasting model instructions 66 therefor are models that estimate or calculate in
advance, that predict or seek to predict. Decision support indicators 96-102 thus focus on
indicating problems and potential problems for user consideration through various
displayed information, e.g., screen shots 140-180.
           When features 104 is selected 340, steps 341-347 comprise selecting one of
30   courses of action feature 110, E-mail feature 106, on-line help feature 116, DSS options
feature 114, metric relationships feature 118, preparing reports using reports wizard 112,

and searching system management tool 10, 30 feature 108. Then, selections 360-369 to display 162, 172, 182 data or to further select data to be displayed 162, 172, 182 may be made.

Decision support indicators 96-102 and certain of features 104, e.g., search 108,

5   courses of action 110, reports 112, and metric relationships 118, comprise corrective action system 20, 44. Corrective means tending or meant to correct or improve, remedial, and so corrective action relates to the doing of something remedial or tending to or meant to correct or improve what is being considered, and so the corrective action system 20 is a system for the doing of something remedial or tending to or meant to correct or improve

10   what is being considered.

When TPE assessment 120 (e.g., assessment and analysis system 22, 46) is selected 350, steps 351 and 352 comprise selecting one of goal assessment 122 and sensor assessment 124, respectively.   Assessment means the act of assessing or of estimating or determining the significance, importance or value of, in this instance, performance

15   relative to a goal or of a sensor. Analysis means a separating or breaking up of any whole into its parts, especially with an examination of these parts to find out their nature, proportion, function, interrelationship, and the like. Assessment and analysis system 22, 46 is a system for assessing or estimating or determining the significance, importance or value of, in this instance, performance relative to a goal or of a sensor or a set of sensors,

20   such as by separating or breaking up of any whole into its parts, especially with an examination of these parts to find out their nature, proportion, function, interrelationship, and the like.

Step 360 comprises displaying a screen 140, 150, 160, 170, 180, in response to having selected 306, 310-352 a link 62-124. Displaying 360 a screen comprises providing

25   links and/or menus for steps 362-368 which comprise selecting any one or more of a time period 142, a month and year 142, a report 144, a sensor 165, 178, a site 165, 178, a metric 166, 175, a set of metrics 166, 175, a set of related metrics 166, 175, a threshold 169, 179, 189, and a source of data 158, 176. When a time period 142, a month and year 142, a report 144, a sensor 165, 178, a site 165, 178, a metric 166, 175, a set of metrics

30   166, 175, a set of related metrics 166, 175, and/or a source of data 158, 176 have been selected 362-368, step 369 comprises displaying a graphical representation 162, 172, 182

of data relating thereto, wherein the graphical representation 162, 172, 182 may be in the form of a graphical plot 162, 172, or of a bar graph 182. Displaying 369 a graphical representation 162, 172, 182 may also include displaying a threshold level 164, 169, 174 with the graphical plot 162, 172 and/or displaying a symbol 163, 173, 183 indicating a

5   good condition, such as an arrow 163, 173, 183 having the word "good" therein.

Bracket and line 370 indicates that the screens displayed in response to the selections 310-369 described above in relation to FIG. 10 include links, e.g., through menu bar 61 and/or by specific links on a particular screen (e.g., links to metric definitions and collection plan 72 on screens 160, 170, 180) to ones of the links selectable

10   306 from home page 60 and from the selections 310-369 thereunder. Thus, system management tool 10, 30 may be easily navigated from a presently displayed screen to another screen without having to return to home page 60 each time.

Thus, there has been described a system management tool that is not a slave to accounting systems but does address management concerns. The tool is designed to be

15   used over a network, which allows widely dispersed users to access the tool. This makes the tool useful to both workers, mid-level managers and high-level managers and avoids repeating information throughout an organization.

The methods described herein can be implemented as computer-readable instructions stored on a computer-readable storage medium that when executed by a

20   computer will perform the methods described herein. A tool implemented on a computer is commonly referred to as a software tool or as an application, e.g., such as system management tool 10, 30, and tools 88, 90.

While the invention has been described in conjunction with specific embodiments thereof, it is evident that many alterations, modifications, and variations will be apparent

25   to those skilled in the art in light of the foregoing description. Accordingly, it is intended to embrace all such alterations, modifications, and variations in the appended claims.

Abstract

A system management tool ~~(10) includes an input system (12). An electronic~~ ~~library (14) is connected to the input system (12) and includes a process diagram (16) for~~ ~~modeling a system. An evaluation system (18) is connected to the electronic library (14).~~ ~~A corrective action system (20) is connected to the evaluation system (18). An~~ ~~assessment and analysis system (22) is connected to the corrective action system (20).~~ ~~The assessment and analysis system (22) measures and documents a corrective action~~ and method is provided on a computer controlled by a machine readable instructions and comprises a library and plural external databases containing information relating to plural systems and/or subsystems. A home page provides links to the library, interactive links to the plural external databases; links to indicators for supporting a decision and to elements thereof including forecasting elements and unstable metrics, and links to technical performance evaluations and elements thereof including assessment elements. Screen shots displayed in response to selecting links on the home page provide selectable lists including at least a list of metrics and a list including ones of the systems and/or subsystems, and a graphical display for a selected metric and a selected system or subsystem of data for the graphical display is provided from the library, or the plurality of external databases, or both.